



**ENERGY REGULATORY COMMISSION**



**ENERGY DEVELOPMENT CENTER**



IEEJ: August 2016

# MONGOLIA

## COUNTRY REPORT



Prepared by JICA trainee ERDENEBULGAN Bazarvaani  
SHIJIRBAT Sharaa

**JUNE 2016**

# GENERAL INFORMATION

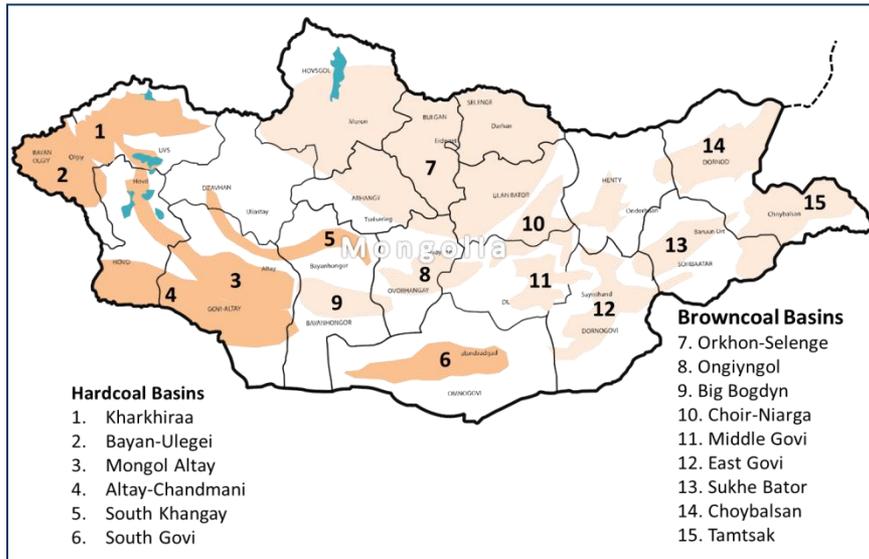
- **Geography:** Mongolia is situated in northern Asia, bordering China and Russia.
- **Population:** 3.1 million
- **Ethnic groups:** Mongols 95%, Kazakhs 5%
- **The total land area:** 1.56 million square kilometers.
- **Lowest annual average:**  $-33^{\circ}\text{C}$  ( $-50^{\circ}\text{C}$ )
- **Highest annual average:**  $+23^{\circ}\text{C}$  ( $+35.8^{\circ}\text{C}$ )
- **GDP nominal:** Total USD 12.5 billion, Per capita USD 4,353
- **Natural resources:** Coal (thermal & metallurgical), copper, molybdenum, silver, iron, phosphates, tin, nickel, zinc, wolfram, flourspar, gold, uranium and petroleum
- **Currency:** MNT togrog, USD1=MNT2000
- **Major industries:** Mining, cashmere and agriculture



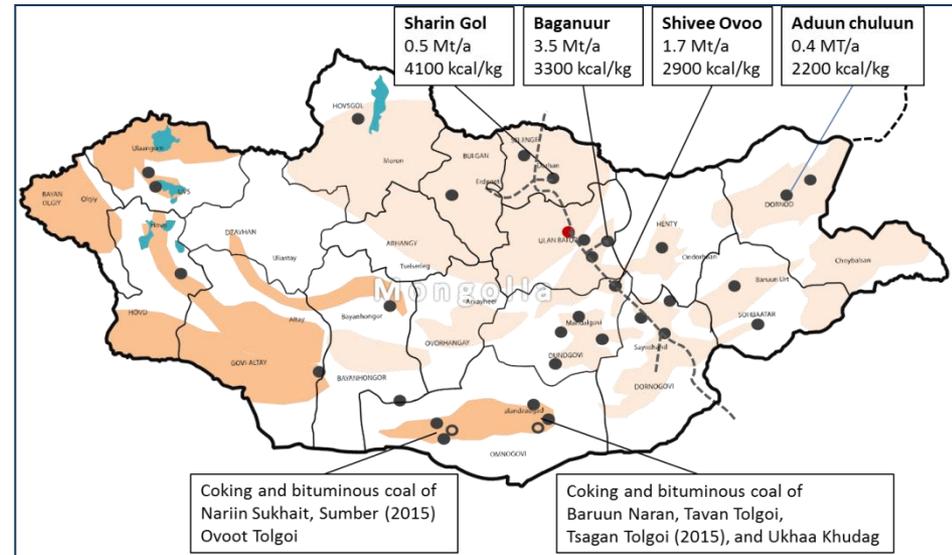
# ENERGY ENDOWMENTS IN MONGOLIA

## COAL

### Coal Basins



### key Mines



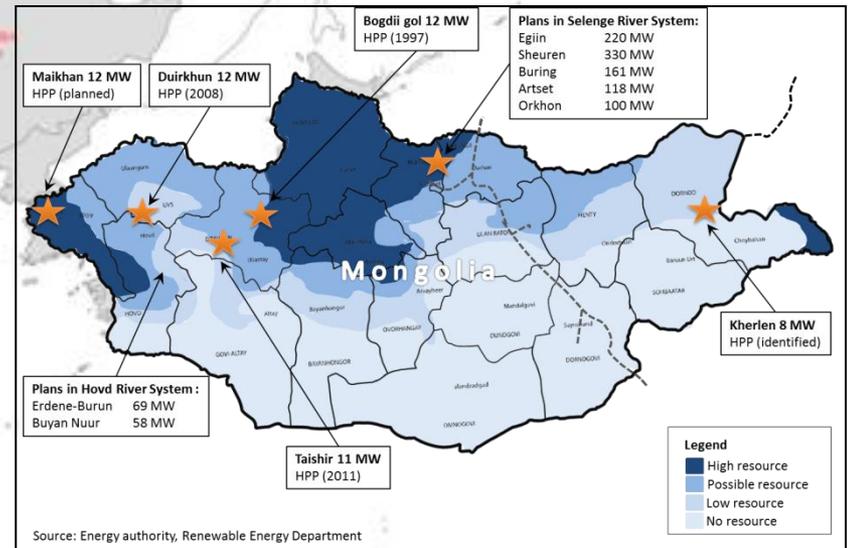
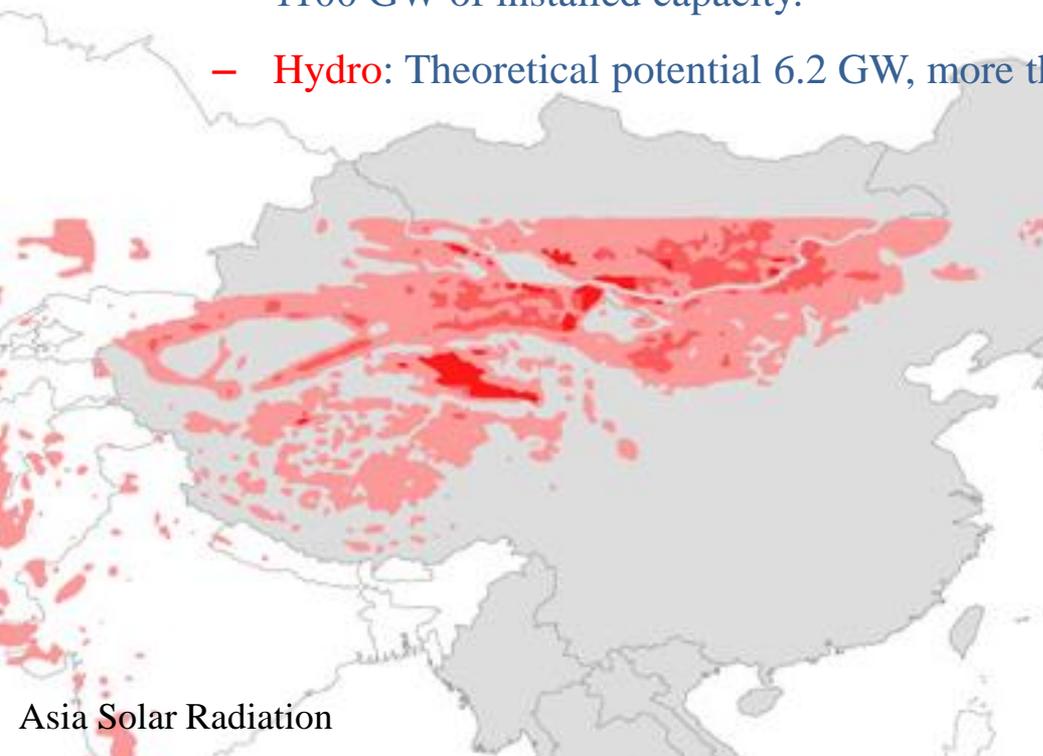
- **Estimated total resources ~ 173 billion ton in 15 coal basins**
- **Over 370 identified occurrence in 85 deposits**
- **Proven Reserves 12 billion ton, of which 2 billion is coking coal**
- **Around 1/3 in Gobi Region**
- **Around 1/3 in Eastern Region**

- **Mines in Gobi area are for export /18 million in 2013/**
  - **Nariin Sulhait**
  - **Tavan tolgoi**
- **Mines in other region are for power production and household heating /12 million in 2013/**
  - **Baganuur, Shivee-Ovoo, Shariin Gol, Aduunchuluun etc.,**

## ENERGY ENDOWMENTS IN MONGOLIA

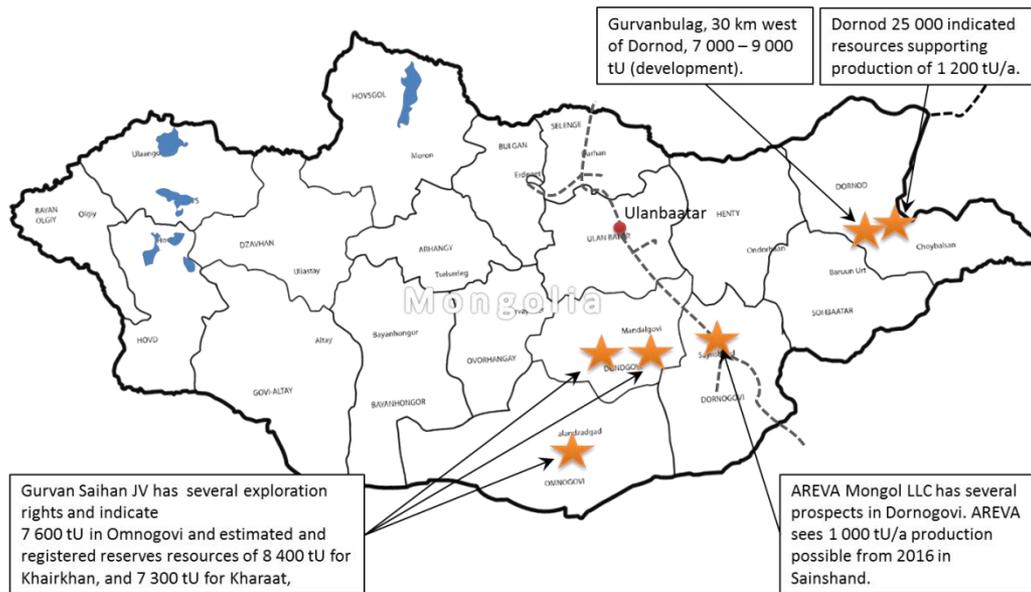
### RENEWABLES

- Rich resources of Solar, Wind and Hydro in Mongolia:
  - **Solar:** 270-300 sunny days in a year, 4.3-4.7 kWh/meter or higher per day
  - **Wind:** 10 % of the total land area can be classified as excellent for utility scale applications, Power density 400-600 W/m<sup>2</sup>, the resource could potentially supply over 1100 GW of installed capacity.
  - **Hydro:** Theoretical potential 6.2 GW, more than 1 GW of these has been identified



# ENERGY ENDOWMENTS IN MONGOLIA

## URANIUM



- **Mongolia contains six uranium strata and more than 100 uranium deposits.**
- **Mongolian geologists now believe that Mongolia has 60,000 metric tons of uranium reserves, while Russian experts have much higher estimates, ranging from 120,000 to 150,000 metric tons.**
- **Main uranium deposits located in the Western province.**
- **Dornod Deposits-28868 tonne,**
- **Gurvanbulag Deposit- 16073 tonn,**
- **Mardai Deposit 1104 tonne.**

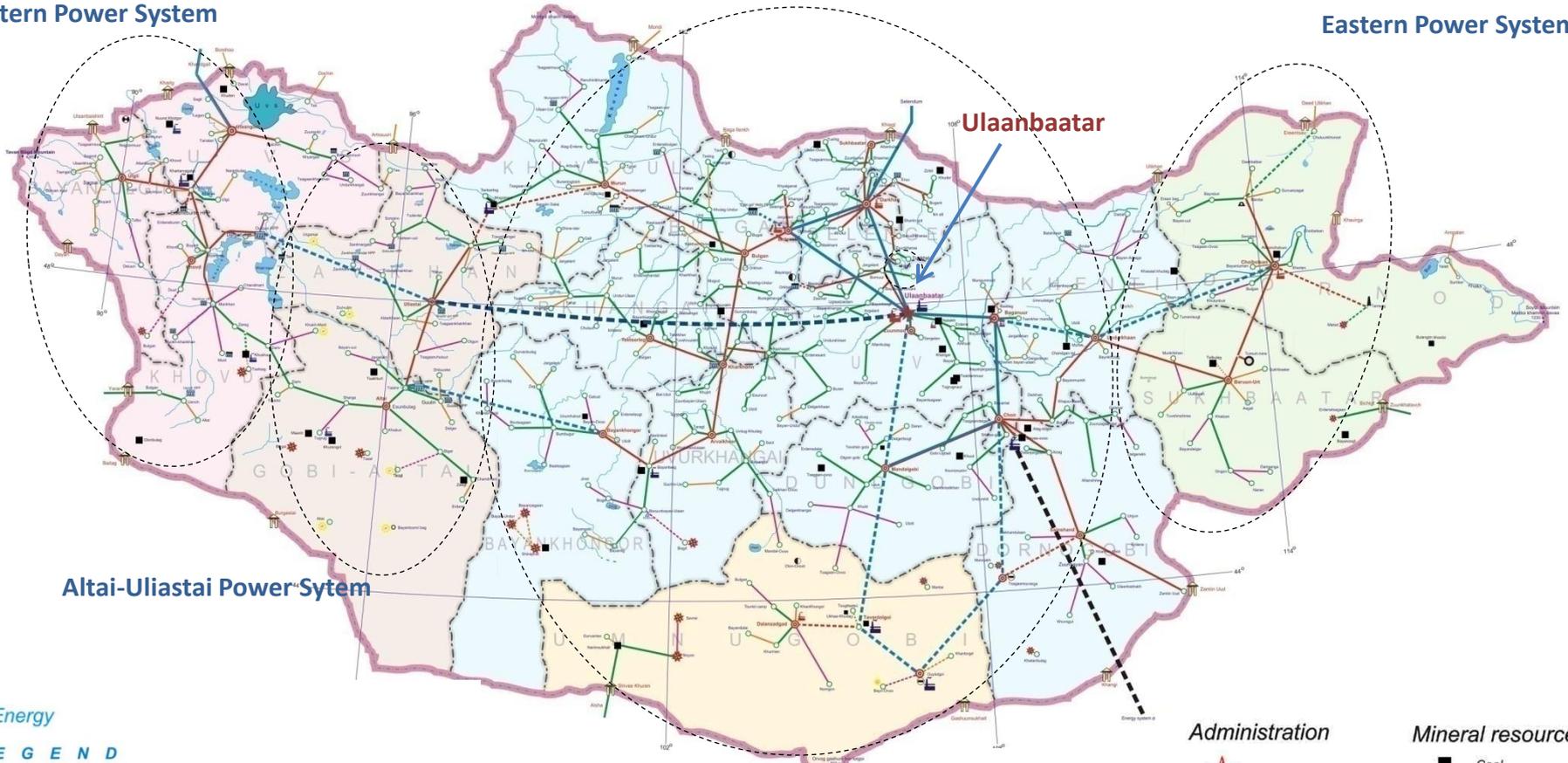
### Uranium Resources in Mongolia

# ENERGY SECTOR OF MONGOLIA- CURRENT STATE

Western Power System

Central Power System

Eastern Power System



Altai-Uliastai Power System

## Energy LEGEND

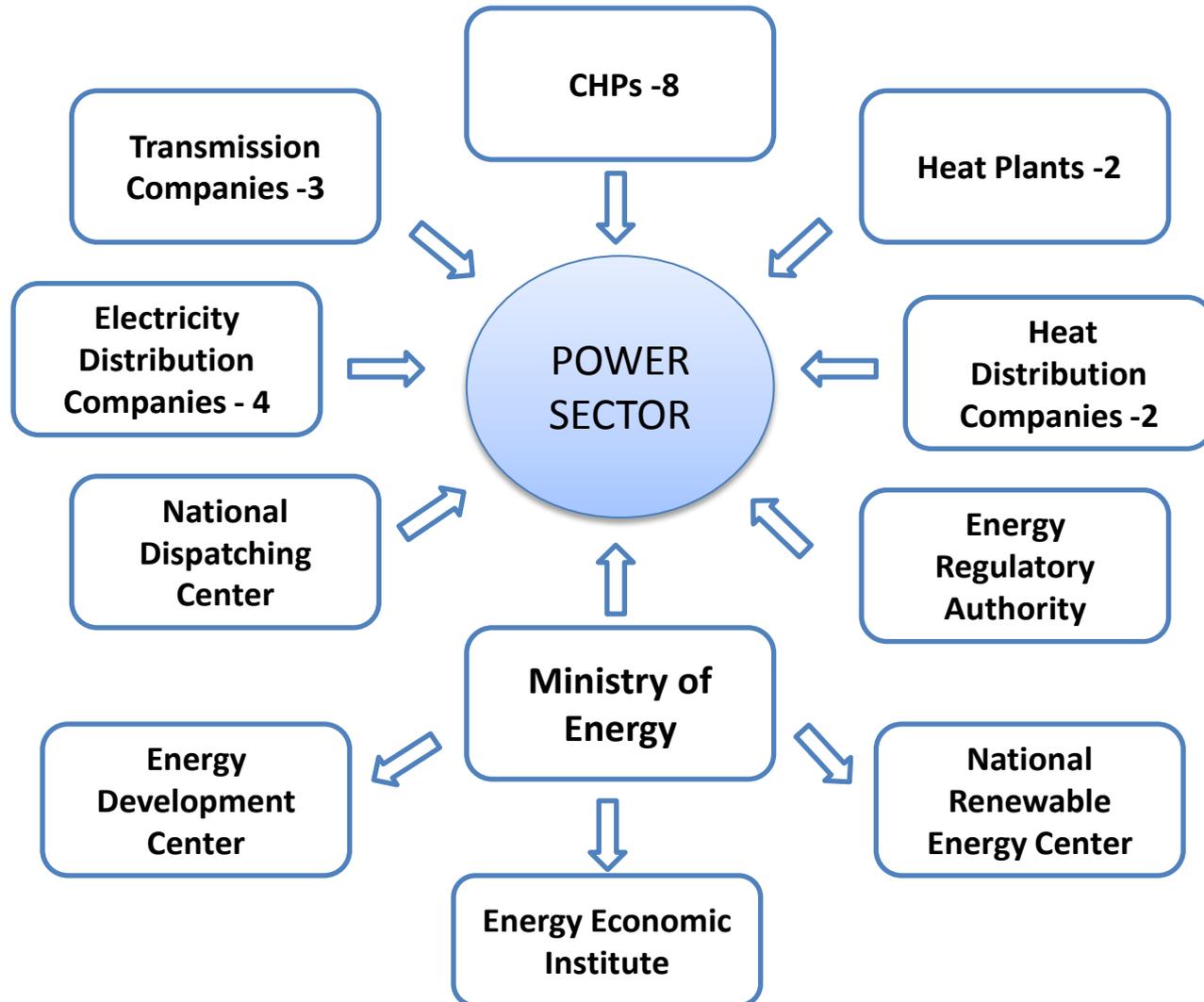
- 400 kV Transmission Line, planned
- 220 kV Transmission Line, used
- 220 kV Transmission Line, planned
- 110 kV Transmission Line, used
- 110 kV Transmission Line, planned
- 35 kV Grid, used
- 35 kV Grid, planned
- 15 kV Grid, used
- 15 kV Grid, planned
- 10, 6 kV Grid, used
- Thermal Electrical Power station in operation
- Thermal Power Station in operation
- Thermal electrical Power Station, planned
- Hydro Power Plant, to built
- Hydro Power Plant, used
- PV-Wind-Sun-Diesel-Hybrid-System, used
- PV-Sun-Diesel-Hybrid-System, planned
- PV-Wind-Diesel-Hybrid-System, in operation
- 220 kV Transmission Line, used /110 kV transmission line/
- 600 kV Transmission Line, planned

- Central Energy System
- Eastern Energy System
- Western Energy System
- Altai-Uliastai Energy System
- Southern Energy System

- ### Administration
- Capital
  - Center of Province
  - Small city
  - Soum center
  - Village
  - Borderport

- ### Mineral resources
- Coal
  - Silver
  - Gold
  - Copper
  - Zinc
  - Oil
  - Uranium

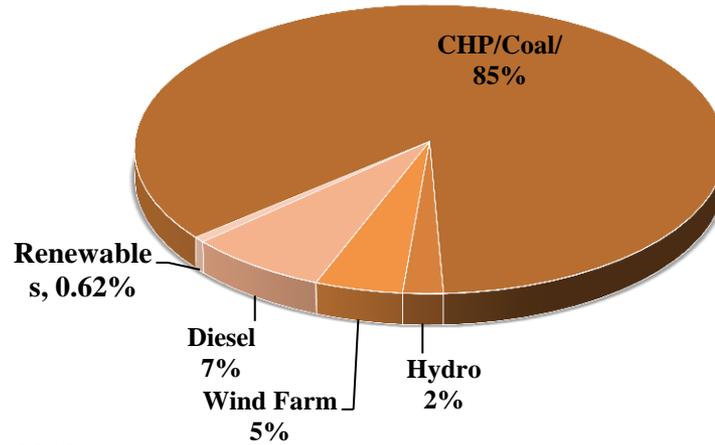
## ORGANIZATIONAL STRUCTURE IN ENERGY SECTOR



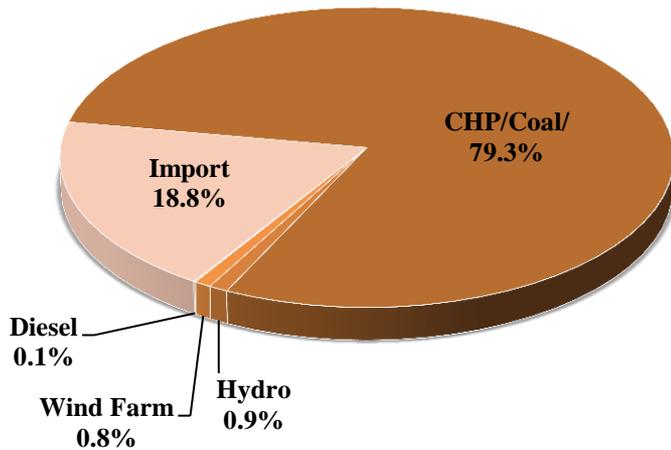
# ENERGY SECTOR OF MONGOLIA

## CURRENT STATE

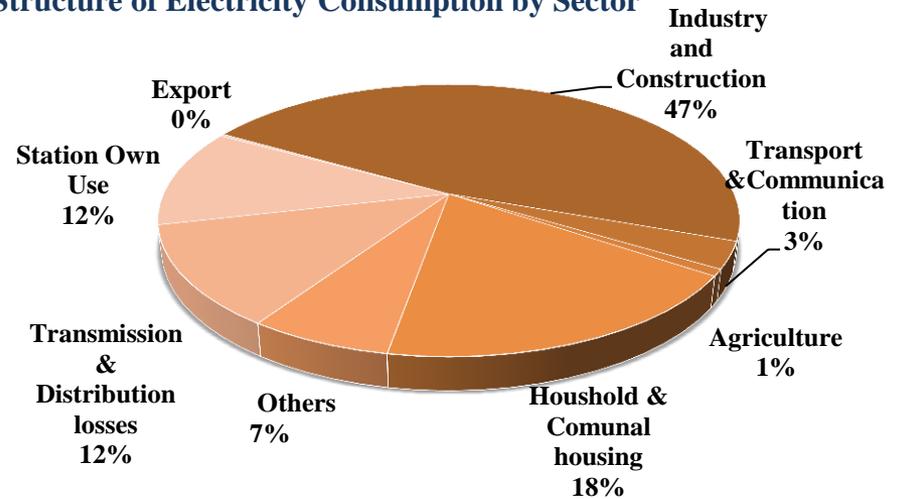
**Total Installed Capacity of Power Plants-1235 MW,  
by type**



**Electricity Production + Import, 2013  
by type of sources, total 6.3 bln.kWh,**



**Structure of Electricity Consumption by Sector**



## ENERGY SECTOR OF MONGOLIA

### CURRENT STATE

- **Central energy system (CES): 94.6%**
  - There are 5 CHPs and 1 wind park are generating electricity;
  - 220 kV double lines connect to Russia;
- **Western energy system (WES): 2.5%**
  - 25% of power supply is from 1 small hydro power plant;
  - WES is connected at 110 kV to Russia
- **Eastern energy system (EES): 3.5%**
  - 1 CHP is generating and supplying this area
- **Southern energy system (SES): 0.8%**
  - Most of electricity supply is from China and also very small CHP is generating
- **Altai-Uliastai energy system (AUES): 1.1%**
  - 3 small hydro power plants and 2 diesel power plant generating 80% of electricity supply and 20% is supplied by CES
- Considering the seasonal variation in electricity demand, imported electricity is required to meet demand especially during peak demand times in the winter

## ENERGY SECTOR OF MONGOLIA

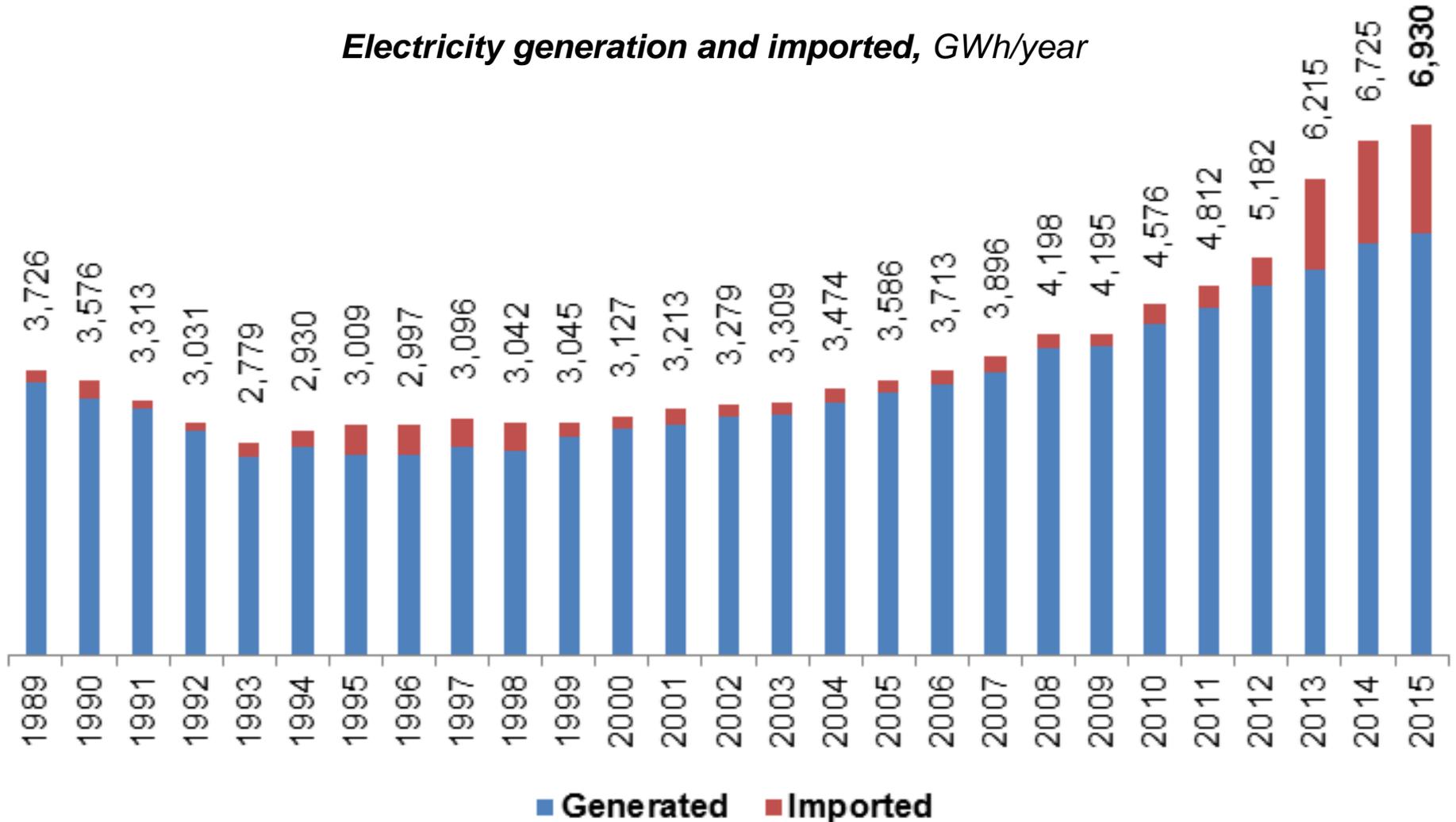
### CURRENT STATE

- Electricity market- Single buyer model in CES
  - ▣ Producers: 5 of CHP plants, 1 of WP
  - ▣ Transmitter: 1
  - ▣ National dispatching center: 1
  - ▣ Distributors & suppliers: 12
- All Mongolian CHP plants are state-owned, equally divided among the Ministry of Energy, the Ministry of Finance and the State Property Committee by one third each.
- Several operating companies are in charge of operating and managing the power plants and the transmission and distribution grids. Most operating companies are state-owned and others are based on public-private partnerships.

## CURRENT ENERGY POLICY AND MEASURES

### Past energy demand and supply

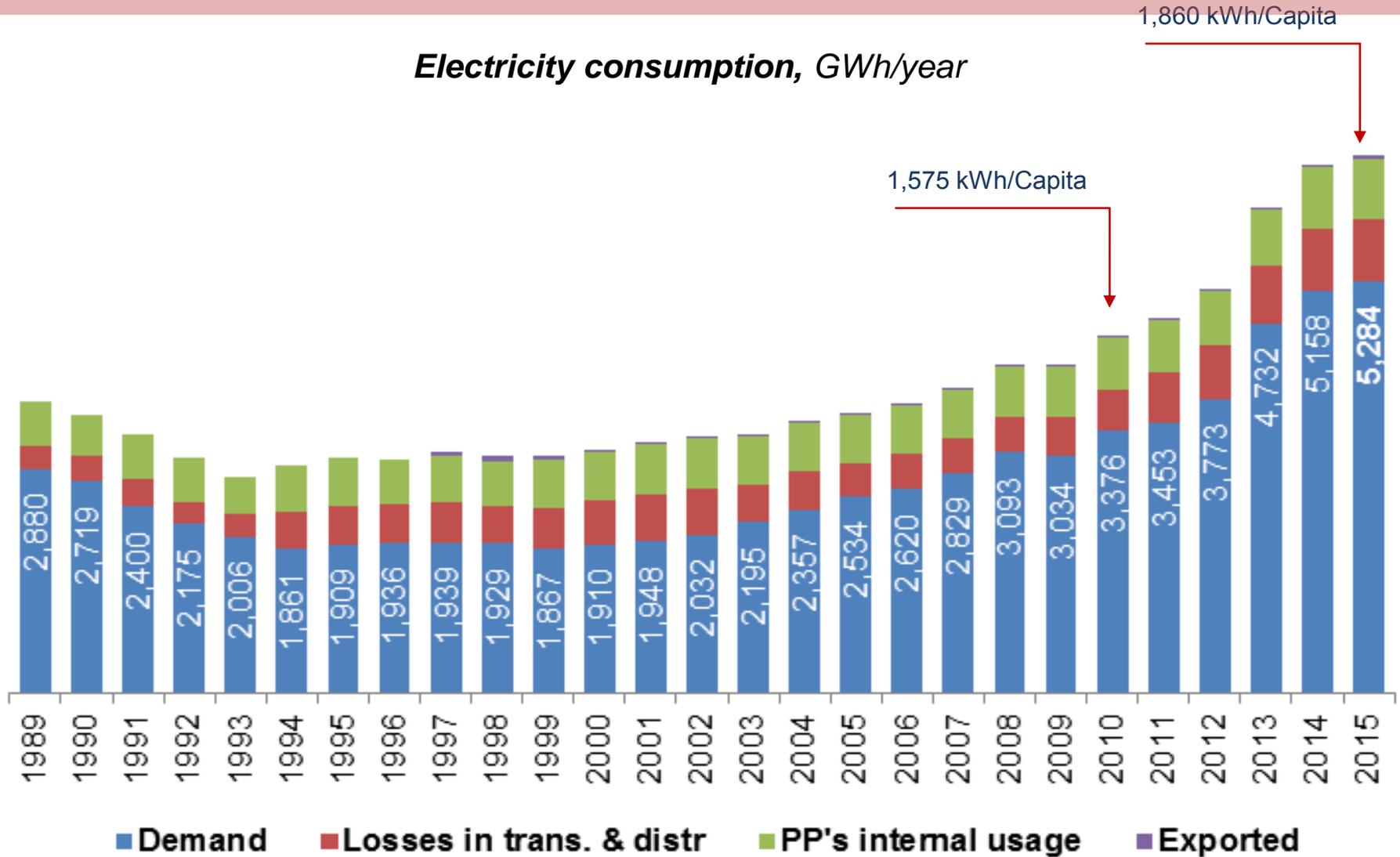
*Electricity generation and imported, GWh/year*



# CURRENT ENERGY POLICY AND MEASURES

## Past energy demand and supply

**Electricity consumption, GWh/year**

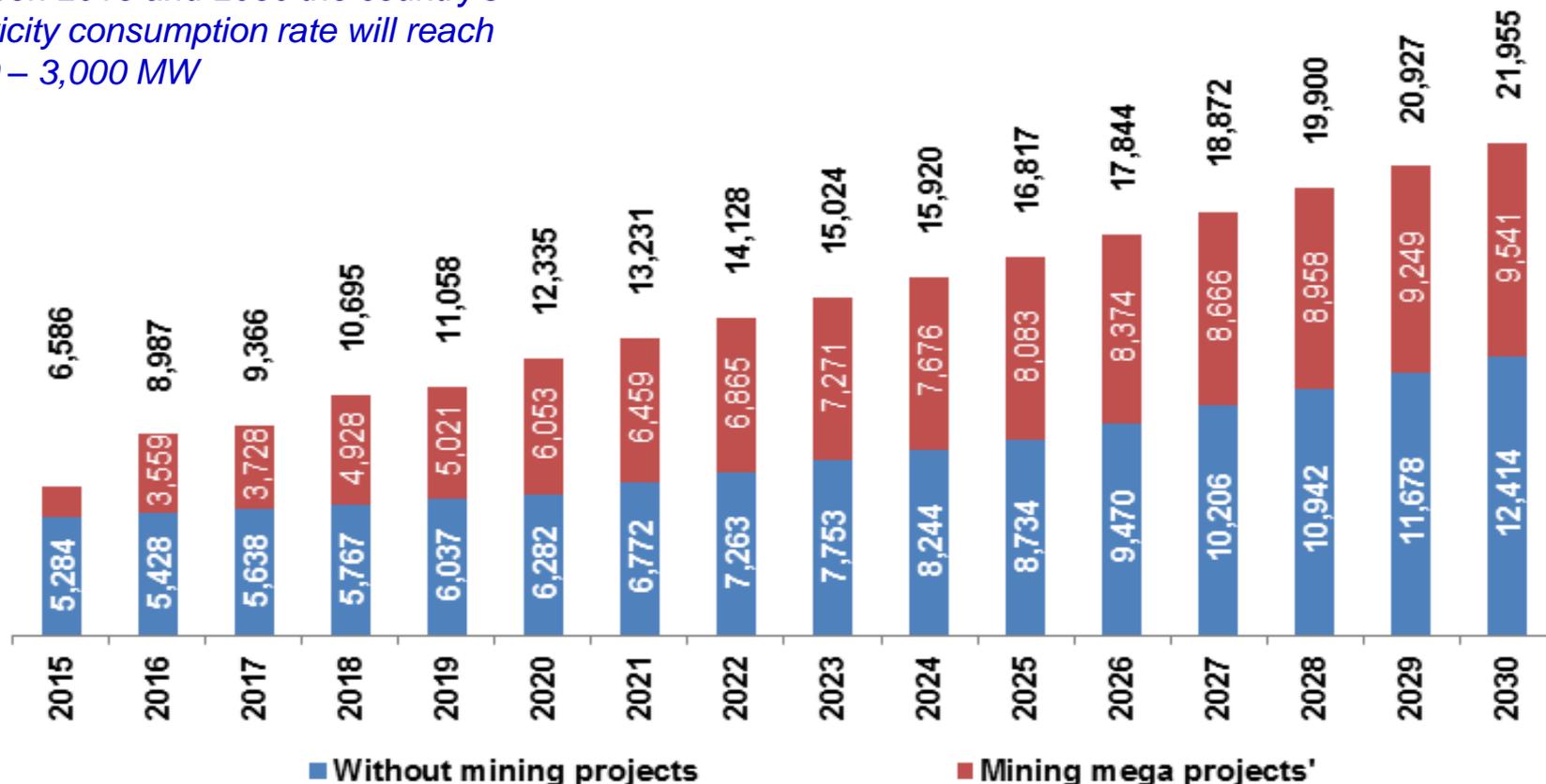


# OUTLOOK OF ENERGY DEMAND AND SUPPLY

## Outlook of energy demand and supply

### Electricity consumption, GWh/year

Between 2015 and 2030 the country's electricity consumption rate will reach 1,600 – 3,000 MW



As Energy Sector Development Plan of Mongolia, 2013

- Average growth is 9.3%
- Average annual added capacity - 174 MW

**Mining projects:** OyuTolgoi- copper mine and TavanTolgoi - coking coal mine

## ENERGY SECTOR OF MONGOLIA- – STATISTICS

### Primary Energy Supply and Economic Indicators

((Unit : 1,000 TOE, %) \*

	2000	2005	2010	2012	Жилийн дундаж өсөлт, (%)		
					'00-'05	'05-'10	'10-'12
Total Primary Energy Supply (1,000 TOE)	2,564	2,800	3,545	8,526	1.8%	4.8%	55.1%
Energy per capita (TOE)	1.06	1.09	1.27	2.97	0.5%	3.1%	52.7%
Population (thousand)	2,408	2,562	2,781	2,868	1.3%	1.6%	1.6%
GDP (billion tog, at 2005 constant price)	2,100	2,780	4,154	5,438	5.8%	8.4%	14.4%
Energy/GDP Intensity (TOE/million Tog)	1.22	1.01	0.85	1.57	-3.8%	-3.3%	35.5%
Import Dependency (%)	19.4%	21.4%	25.6%	15.5%	1.9%	3.7%	-22.2%

### Domestic Production, Import and Export

((Unit : 1,000 TOE, %) \*

	2000	2005	2010	2012	Жилийн дундаж өсөлт, (%)		
					'00-'05	'05-'10	'10-'12
Indigenous Production	2,019	3,592	11,591	14,038	12.2%	26.4%	10%
Import	497.1	597.9	908.9	1321.7	3.8%	8.7%	20.6%
Export	3	1,405	9,028	6,227	236%	45.1%	-16.9%
Total Domestic Energy Supply	2,564	2,800	3,545	8,526	1.8%	4.8%	55.1%

\* 1,000 TOE- 1,000 Tonnes of Oil Equivalent

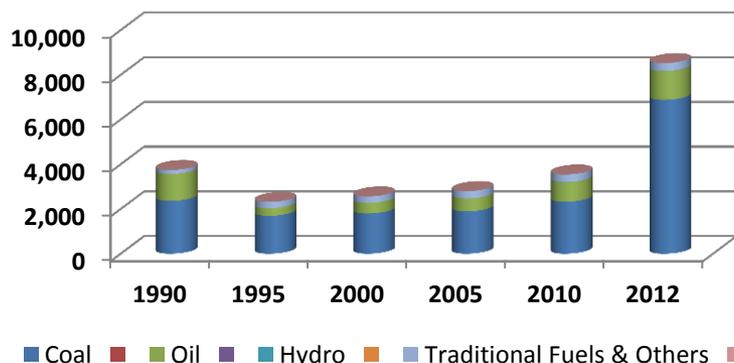
## ENERGY SECTOR OF MONGOLIA- – STATISTICS

### Structure of Primary Energy Supply by Source

(Unit : 1,000 TOE, %)\*

	2000	2005	2010	2012	Жилийн дундаж өсөлт (%)		
					'00-'05	'05-'10	'10-'12
Coal	1,798	1,895	2,324	6,884	1.0%	4.2%	72.1%
	70.2%	67.7%	65.6%	80.7%			
Oil	472	584	879	1,284	4.3%	8.5%	20.9%
	18.4%	20.9%	24.8%	15.1%			
Hydro	0.25	0.28	4.73	8.96	2.1%	76.0%	37.6%
	0.01%	0.01%	0.13%	0.11%			
Traditional Fuels & Others	293	321	337	348	1.8%	1.0%	1.6%
	11.4%	11.5%	9.5%	4.1%			
Total	2,564	2,800	3,545	8,526	1.8%	4.8%	55.1%
	100.0%	100.0%	100.0%	100.0%			

\* 1,000 TOE- 1,000 Tonnes of Oil Equivalent



#### Trend in Supply Share

(2000 → 2005 → 2010 → 2012, %)

- Coal ↓: 70.2 → 67.7 → 65.6 ↑ → 80.7
- Petroleum Products ↑: 18.4 → 20.9 → 24.8 → 15.1
- Hydro ↑ : 0.01 → 0.01 → 0.13 → 0.11
- Traditional Fuels & Others ↓: 11.4 → 11.5 → 9.5 → 4.1

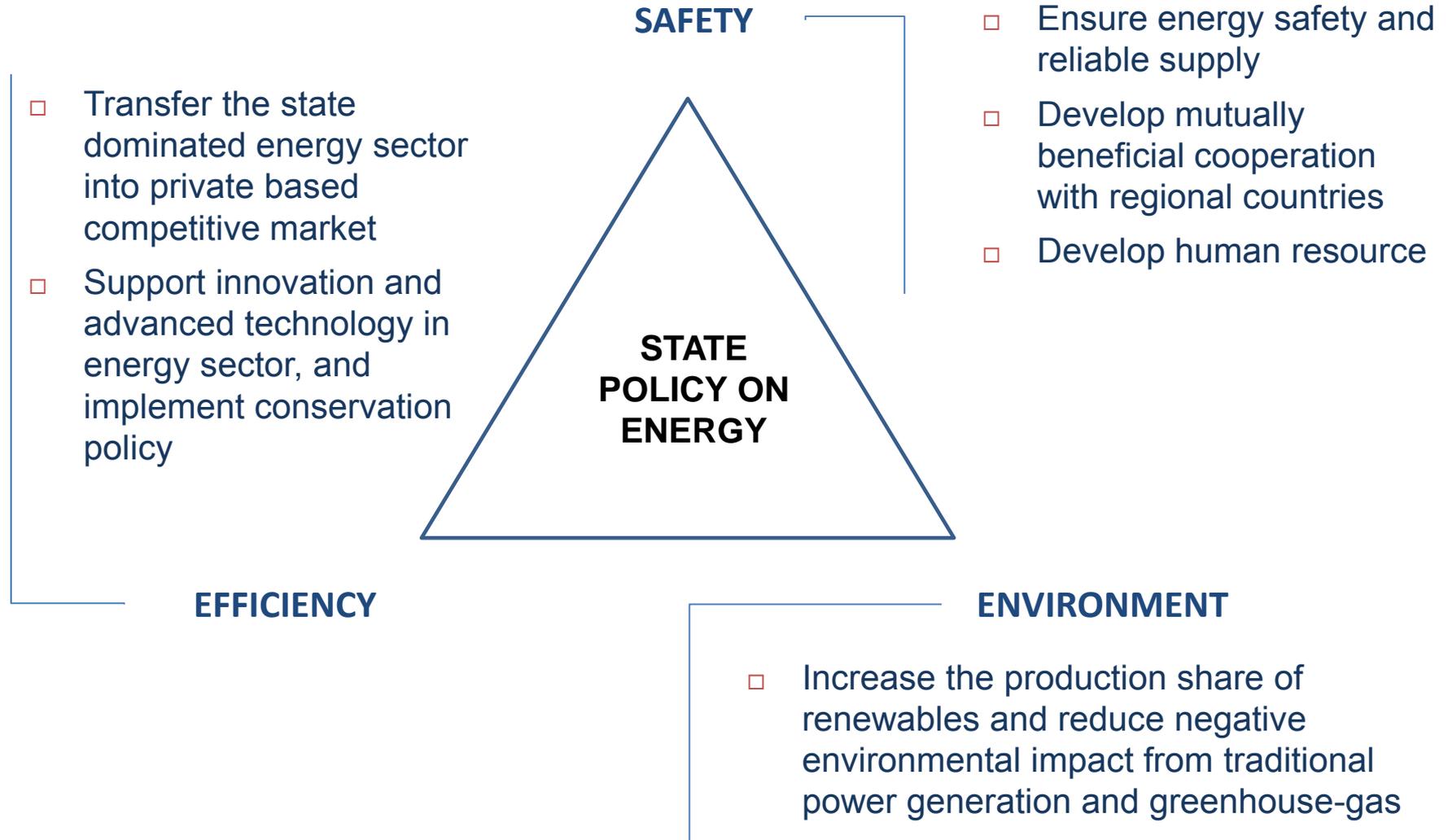
## LEGAL FRAMEWORK & POLICY DOCUMENTS IN POWER SECTOR

No	Document	Approved/ Update	Товч агуулга & гол заалтууд
<b>Legal Framework</b>			
1	Energy Law of Mongolia	2001/2011	Regulate matters relating to energy generation, transmission, distribution, dispatching and supply activities, construction of energy facilities and energy consumption that involve utilization of energy resources & Tariff, License
2	Renewable Energy Law of Mongolia	2007	Regulate generation and supply of energy utilizing renewable energy sources & tariff
3	Concession Law	2010	Establish the framework for granting concessions to private investors to use existing infrastructure facilities owned by the state, and to construct new infrastructure facilities for the purpose of providing services to the general public
4	Investment Law	2013	Protect the legal rights and interests of investors in the territory of Mongolia, to establish a common legislative guarantee for investment, to encourage investment, to stabilize the tax environment, to determine the rights and obligations of investors
<b>Policy Documents</b>			
5	Integrated Energy System Program	2002/2007	Development plan of power sources and transmission lines in Power sector and its implementation plans and actions
6	National Renewable Energy Program	2005	Plans and actions to improve renewable share in structure of energy supply, and widely using renewable energy in providing power to rural areas
9	Infrastructure Development Program of Southern Gobi	2010	Plans and actions to develop infrastructure for strategic mineral deposits in Gobi area

# CURRENT ENERGY POLICY AND MEASURES

## State of the Energy Sector

### “State Policy on Energy” 2015-2030



## CURRENT ENERGY POLICY AND MEASURES

### State of the Energy Sector

#### “State Policy on Energy” 2015-2030

Indicators	2014 /Base year/	1 <sup>st</sup> stage /by 2023/	2 <sup>nd</sup> stage /by 2030/
Reserve Capacity for Electricity Generation	-10%	10%≤	20%≤
Reserve Capacity for Heat Generation in Cities	3%	10%≤	15%≤
Profit Share on Tariff Structure in Central Region	-16.2%	0.0%	5.0%
Own use of CHP's	14.4%	11.2%	9.14%
Transmission & Distribution Loss	13.7%	10.8%	7.8%
Share of Renewable on Total Installed Capacity for Domestic Supply	7.6%	20%	30%
Greenhouse Gas Emission per Gcal Power Generation	0.52 ton CO2 equivalent	0.49 ton CO2 equivalent	0.47 ton CO2 equivalent
Reduction of Building Heat Loss	0%	20%	40%
Technological Achievements that have to be utilized in Energy Sector	CFB	Sub Critical Coal Bed Methane, Battery Energy Storage, Pumped Storage	Super Critical, Ultra S/critical, Hydrogen, Concentrated Solar Plant

# CURRENT ENERGY POLICY AND MEASURES

## State of the Energy Sector

### “State Policy on Energy” 2015-2030

**In the 1<sup>st</sup> stage 2015-2023:** The stage to develop energy resources and backup capacity, establish a foundation for the development of renewable, and commence large scale power plant and DC line projects cooperating with neighboring countries.

- The installed power capacity will be doubled, and start using critical technology with high parameters. Hydro will be taken place at least 10% of the total installed power capacity and it will increase backup capacity to 10%, and create fundament for renewable sector to development intensively.

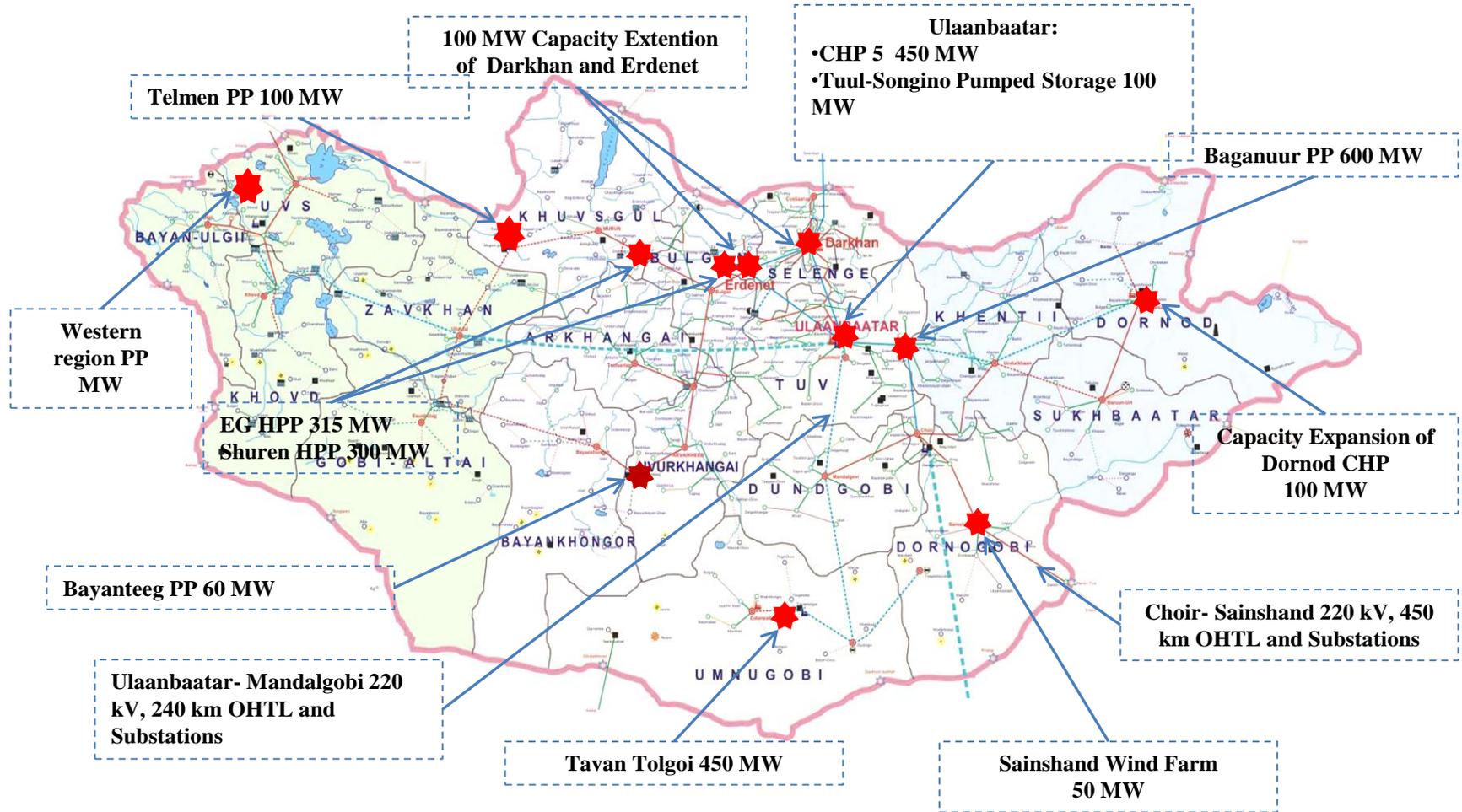
**In the 2<sup>nd</sup> stage 2024-2030:** The stage to export secondary energy and develop sustainably the renewable sector.

- Integrated smart energy system will be created by connecting regions with high capacity transmission lines. State owned Power companies will be become a public company. Distribution and supply service will be privatized and energy sector will be worked as a competitive marked with regulation. Secondary energy will be exported by connecting with North east Asian countries with high capacity DC lines.

# OUTLOOK OF ENERGY DEMAND AND SUPPLY

## Outlook of energy demand and supply

### THE PLANNED PROJECTS IN THE SHORT AND MID-TERM PERIODS



## LEGAL FRAMEWORK & POLICY DOCUMENTS IN POWER SECTOR - SHORT TERM GOALS

- In the framework for ensuring safety and reliability of power sector
  - Commence the projects:
    - CHP 5 of Ulaanbaatar Project,
    - Tavan Tolgoi Electricity only Power Plant Project,
    - Eg Hydro Power Plant Project
- In the framework for improving efficiency:
  - Reduce loss in transmission and distribution network
  - Develop demand side management
- In the framework for developing renewable and environmental protection:
  - Strengthen the renewable energy fund and its activities
- Improve financial capacity of power sector
  - Renew tariff system
  - Increase private sector share in power sector

# INTERNATIONAL COOPERATION POLICY ON POWER SECTOR

## RESOURCE BASED REGIONAL POWER TRADE

### Coal Based

- **On-Site Electricity Production for Purpose of Export.**
  - Abundant thermal coal resources
    - Shivee-Ovoo brown coal deposit
    - Aduunchuluun brown coal deposit
    - Tavantolgoi and Gashuun Sukhait hard coal deposits
  - China leads its Electricity demand growth in the region

### Renewable based

- **Solar and Wind Rich Resources Gobi Area**
  - Gobi Tec and Asia Super Grid Initiative



# Major difficulties and bottlenecks currently faced in formulating energy policies

- In recent years, electric consumption has been raised so national electrical factories capacity is lacking and lifetime of equipment is being higher. These matters are affecting ongoing and reliability of electric supply contrarily.
- Currently, power station with high capability should be established in order to provide development of mining sector, and policy to export power should be implemented instantly in connection with commissioning bigger mining deposits in Mongolia. If these activities are not carried out in short time, energy shortage will be occurred and furthermore it may be one of the factors that slow down country's development.
- To liberalize price of power, to shift this sector market relations completely, and to provide convenient condition that attracts investment.
- Mission of the energy sector is to develop new structure based on technique and technology that are not harmful against nature and environment. In addition, requirements, such as increasing renewable energy share in such sector, as well as establishing large hydro power plants to adjust power system operation using hydro energy, are being faced.
- Electric insufficiency is still high; interest to improve performance of electric consumption is not arisen because of legal framework to encourage and support electric saving is not provided completely.
- Moreover, lack of local areas' heat supply and necessity hot water affect development of rural areas and its citizens' stabilized living condition contrarily.

# SUBJECTS TO STUDY

- Energy demand and supply forecasting (energy balance);
  - In state policy on energy, electricity consumption will raise high, therefore the government issued licences to quite number of IPP and RE projects. But performance hasn't reached forecasted demand yet. If this demand will not change, the government or single-buyer will pay large number of capacity payment to IPPs
- Liberalization of energy sector (electricity market and tariff);
  - Since 2010, the government has been considering liberalization of energy sector. But now electricity market is still monopol market and energy tariff is controlled and main companies in energy sector are owned by state. There is not any development.
- Experience of energy market from other countries;
- Energy and other resource data management;
  - Mongolia is mainly considering electricity, heat and resources of them in energy sector. Since updated law on energy from 2015, natural gas for households is added.



Thank you